White Paper

Dual-Core Intel® Itanium® 2 Processor

Data Center Planning

Business-Critical Infrastructure

The End of the Proprietary Era

Itanium® 2-based solutions are changing the economics of business-critical computing

Market momentum for Itanium® 2-based solutions is growing worldwide, as businesses move away from proprietary architectures to reduce their total costs and achieve higher levels of performance, scalability, and availability. Systems based on the new Dual-Core Intel® Itanium® 2 processor are helping to accelerate this transition, by delivering twice the performance of previous systems, while improving energy-efficiency by about 2.5 times.

"Increasingly, organizations are relying on Itanium to address some of the most critical needs of their business."

– Nathaniel Martinez and Thomas Meyer, IDC[1]

[1] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

Executive Summary

"The Intel® Itanium® 2 processor has shown that it can run very large, mission-critical, enterprise-wide systems, and do it very well."

– Larry Godec, CIO, First American Title Insurance Company

Many of the world's largest and most successful organizations are deploying Itanium®-based solutions to cut costs and improve agility for some of their most demanding, business-critical applications. Adopters include more than 70 of the world's 100 largest companies, including 9 of the top 10 automotive companies, 8 of the top 10 banking companies, 14 of the top 15 energy companies, and 4 of the top 5 healthcare companies.

By the end of the first quarter of 2006, approximately 99,000 Itanium®-based systems had already been deployed around the world,[2] in configurations ranging from small 2-way servers to massive systems with up to 512 processors.[3] Customers are reporting a high level of satisfaction[4] and systems based on the new Dual-Core Intel Itanium 2 processor can be expected to provide another major boost in adoption rates. These servers deliver twice the performance of previous systems, while consuming up to 20 percent less energy and providing expanded enterprise capabilities that help businesses achieve even higher levels of performance, flexibility, and availability.

It has taken time for application support to reach critical mass for Itanium-based systems, but that time has clearly arrived. Software availability has more than doubled in the past 12 months to more than 8,000 optimized applications and tools. In addition, new binary translation technologies will soon enable Sun Solaris-based applications, and many others, to run without change and with near-native performance on Itanium-based systems. This breakthrough capability will greatly reduce the cost and complexity of migration, enabling more businesses to take advantage of the flexibility and value of Itanium-based solutions.

Businesses around the world are finding that Itanium-based servers enable them to substantially reduce their total costs, while gaining the flexibility to choose from 10 operating systems, dozens of hardware vendors, thousands of applications, and a large community of independent solution providers. For organizations that are tired of the high cost and limitations of proprietary architectures, Itanium-based solutions offer a new model for business-critical computing—one that is rapidly gaining traction in the worldwide marketplace.

[2] Based on data from *IDC Server Tracker* Q1, 2006.

[3] A notable example is NASA's Columbia supercomputer, which includes 20 Itanium-based systems, each with 512 processors: www.intel.com/technology/computing/hw10041.htm

[4] *"Satisfaction among current Itanium customers is high, with two-thirds applying the highest satisfaction ratings for their Itanium servers."* Source: IDC, "Customer Perceptions of the Future of Itanium," Michelle Bailey, Crawford Del Prete, Vernon Turner, Matthew Eastwood , Stephen L. Josselyn, Doc #34842, February 2006, available for purchase at: www.idc.com/getdoc.jsp?containerId=34842

The Escalating Challenges of Business-Critical Computing

"The challenges that IT departments are currently facing are twofold. The first is internal to the organization and pertains to the cost of IT. The second challenge is in response to ever-faster changing market conditions.... IT has historically responded slowly to business change."
– Nathaniel Martinez and Thomas Meyer, IDC [5]

In virtually every industry and field of study, organizations are faced with rapidly growing computing needs. Whether they are involved in disaster relief or energy exploration, health research or automotive design, financial markets or retail, the story is similar. Data and transaction volumes are rising, applications are becoming more complex, and integration requirements are increasing.

This is not a challenge that will go away anytime soon. Ubiquitous connectivity, new data sources (RFID, sensor nets, etc.), growing compliance requirements, real-time transactions, and escalating security threats are all adding to the pressure on today's business-critical systems. Yet even as computing needs grow, economic constraints are becoming more stringent. Decision-makers are demanding the same kinds of returns and assurances from IT that they demand from other business investments. Technical excellence, alone, is no longer sufficient. Total costs must be contained, and solutions must become easier to deploy, scale, and adapt to provide quicker payback and deliver better long-term value.

Many emerging IT capabilities are helping organizations meet this challenge, from Web services and service-oriented architecture (SOA), to virtualization and automated management tools. Itanium-based solutions are playing a fundamental role in this evolution. By delivering high-end computing capabilities on a standards-based architecture, they bring choice, flexibility and affordability to business-critical computing, an area where high cost and inflexibility have long been the status quo. As the number of optimized applications has grown, IT organizations have taken note, and Itanium-based solutions are seeing steadily increasing adoption worldwide.

"At IDC, we saw approximately $3 billion of Itanium sales in the past four years being met with nearly $3 billion in the next 15 months..."
– Vernon Turner, IDC [6]

Case Study: Itanium-based Solutions in Action

DuPont

- A global leader in technology innovation
- 75 R&D and customer service labs worldwide
- 60,000 employees; $27.3 billion in revenue

DuPont relies on its world-class research teams to deliver technology innovation across a wide range of industries. In a move to upgrade its core computing capabilities, the company worked with Intel® Solution Services[a] to confirm the value of migrating its 6 separate RISC architectures to Intel Itanium 2 and Intel® Xeon® processor-based servers running Red Hat Enterprise Linux*, and to determine best practices for smooth migration and operation. According to Tim Mueller, supervisor of DuPont's High-Performance Computing Group, ***"We knew that our current outsourced RISC architecture-based environment was not going to scale to meet our long-term growth needs. And though we wanted greater performance, we also had budget considerations."***

The test results were unequivocal. On average, the Intel processor-based systems delivered a 4x-5x performance boost, for an 8x improvement in price performance. Additional gains are expected due to standardization of the HPC environment and reduced software licensing fees from running larger workloads on fewer processors.

Read the complete Intel case study at:
www.intel.com/business/casestudies/dupont_datacenter.pdf

[a] For more information on Intel Solution Services, visit: www.intel.com/go/intelsolutionservices

[5] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

[6] As quoted in the article: *Vendors Join Forces to Boost Itanium*, by Amy Newman, ServerWatch.com, September 26, 2005: www.serverwatch.com/news/article.php/3551391

Mainframe Capabilities at Mainstream Prices

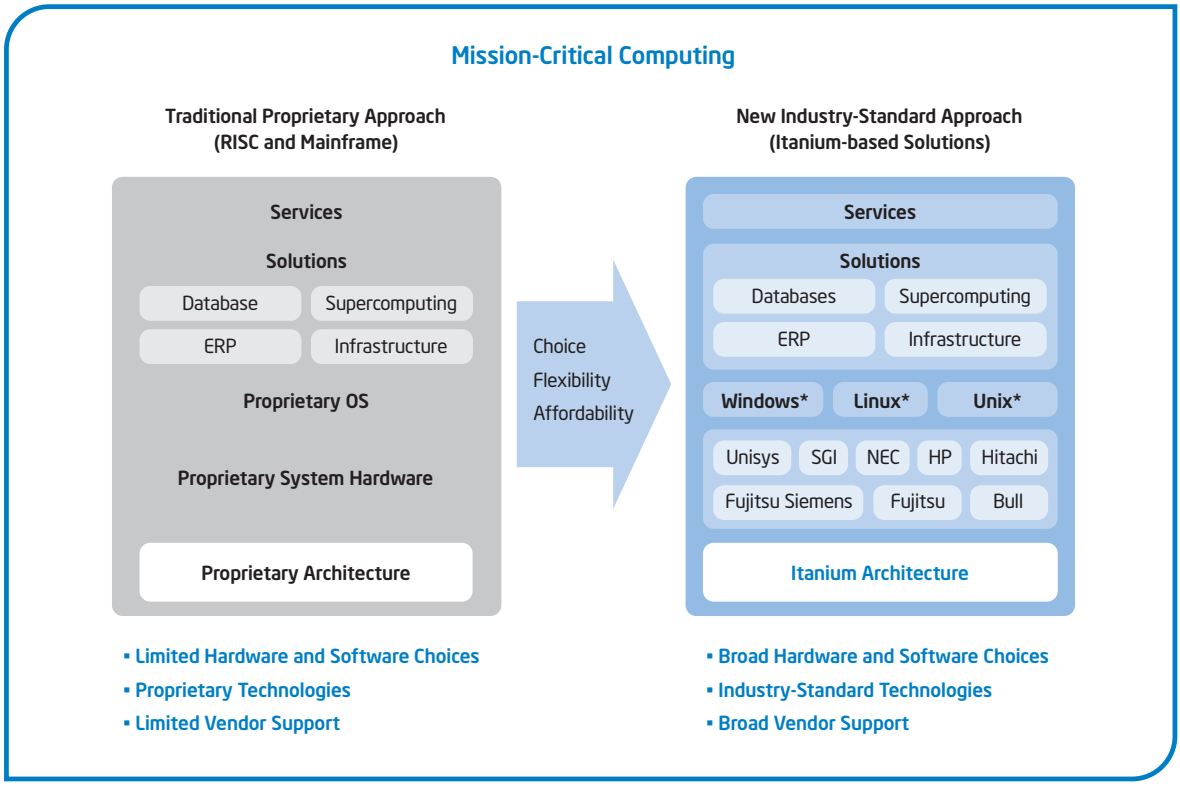
"Not only was the performance of the Intel architecture-based systems impressive, but they cost about half as much as the RISC-based platform."

– Tim Mueller, supervisor, DuPont High-Performance Computing and Computation Sciences Groups

For years, affordability and business-critical computing have been mutually exclusive. Solutions have been based on proprietary architectures and solution stacks that are developed and supported largely by a single vendor.[7] Deploying these solutions requires a major investment, and leaves customers with few options in terms of systems, technologies, operating systems, and vendors. This, in turn, limits their ability to control cost and risk and to take advantage of broader industry advances.

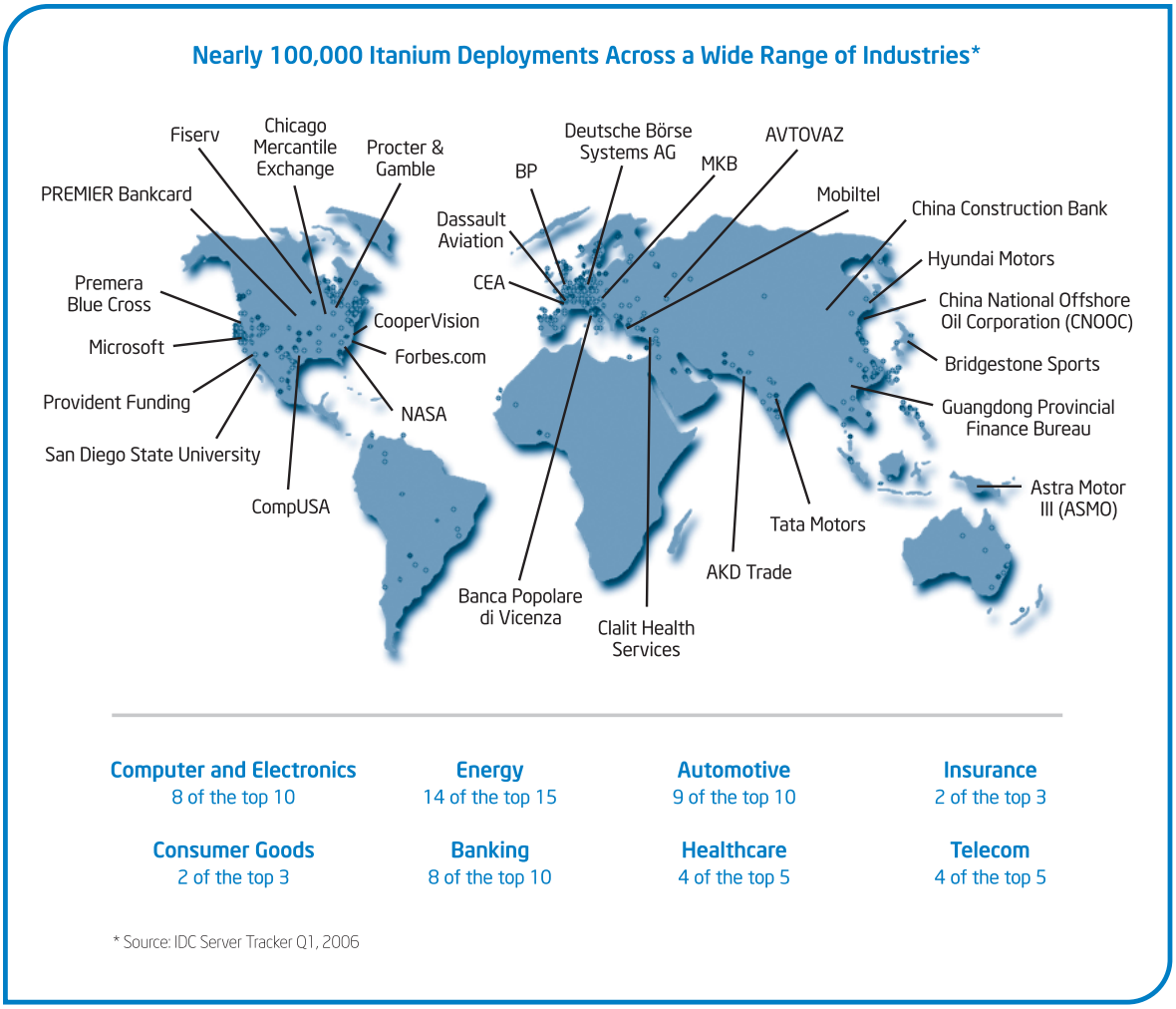
Until recently, organizations had little choice but to deploy these proprietary architectures. Today they do have a choice. Itanium-based solutions deliver high-end performance, scalability, and availability on affordable, industry-standard systems that are supported by a broad array of vendors, operating systems, and applications (Figure 1).

Figure 1. Itanium-based solutions offer an unprecedented level of choice and flexibility for business-critical computing, and can be instrumental in helping businesses get better total value from their IT investments.



[7] Although proprietary vendors are moving toward more open software platforms, support for standards-based software should be carefully investigated, and it should be noted that performance claims often depend on proprietary software stacks.

Figure 2. Adoption of Itanium-based solutions is a worldwide phenomenon, with strong growth occurring in both developed and emerging regions.



Market response has been positive, with consistent growth over the past two years. According to IDC, factory revenue for Itanium 2-based solutions grew 60 percent year over year in 2005.[8] That is faster than factory revenue grew for SPARC or IBM Power architecture at comparable points in their early years. Growth is accelerating and momentum is strong across all geographies and multiple vertical industries (Figure 2).

Given the proven potential for TCO reduction, why has the adoption of Itanium-based solutions not been even faster? Because businesses must have complete solutions that can be deployed easily across a wide range of business needs. As complete solutions have emerged for particular applications and industries, the adoption of Itanium-based systems has increased accordingly. Solution availability has improved dramatically in the past year, and this is fueling broader and faster adoption.

[8] Source: *IDC Server Tracker*, Q4 2005.

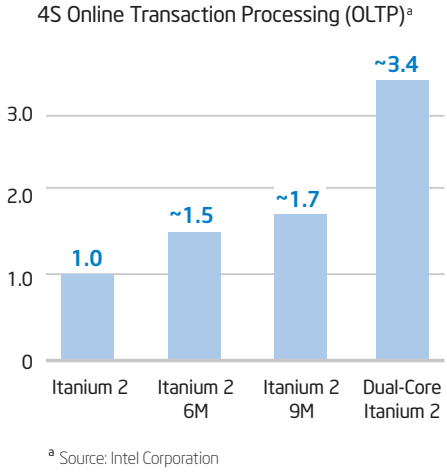
Ongoing Performance and Capacity Scaling

"This system is smoking fast–well beyond expectations. It is amazing hardware."

– Quentin Hurd, Product Manager Licensing Technologies and Analytics Group, Microsoft Corporation[9]

The performance of Itanium-based systems has ramped steadily, and results are strong across a wide range of industry-standard benchmarks and real-world applications. New Dual-Core Intel Itanium 2 processors deliver another major leap in processor capability (Figure 3). With two execution cores, these processors double performance compared to previous systems, while reducing power consumption from 130 watts to about 100 watts (for 2.5 times better performance per watt).[10] A number of system vendors have already taken advantage of these new processors to achieve world record performance on various industry standard benchmarks.[11]

Figure 3. The new Dual-Core Intel Itanium 2 processor adds another step in the ongoing capacity and performance scaling of Intel Itanium 2 architecture.



In addition to ramping performance, new Dual-Core Itanium 2-based systems include silicon-level support for virtualization, along with new RAS features that help to improve availability across diverse implementations. These advances are just the beginning. Intel has four future Intel Itanium 2 processors in development, and a long-term roadmap that can be expected to drive rapid and ongoing performance scaling through 2010 and beyond. Intel is also at least a year ahead of the rest of the industry in silicon process technology, which will be instrumental in delivering future generations of Intel Itanium 2 processors that provide leading performance, functionality, and value for data-intensive solutions.[12]

Case Study: Itanium-based Solutions in Action

China National Offshore Oil Corporation (CNOOC)

- One of the world's largest oil and gas companies
- 5th largest profit engine of all state-owned enterprises in China
- Provides critical support for China's growing economy

The growth and modernization of China's economy were placing new pressures on CNOOC. Oil demand was growing rapidly and the company's monopoly status was giving way to increasing competition from both foreign and domestic oil companies. To increase efficiency and reduce risk, the company migrated its mission-critical RISC-based system to an Itanium-based server that could meet growing demands cost-effectively, and provide a more scalable foundation for future growth.

With this solution, CNOOC is able to run more complex oil reservoir simulations, which helps the company reduce risk in new developments and improve output for existing reservoirs. According to Li Jinshui, Director and General Manager of SGI Greater China, ***"The Itanium® 2-based SGI* Altix 350* server is an industry standard server that costs only a quarter of CNOOC's previous system, but improves the company's work efficiency by up to five times."***

Read the complete case study at:
www.intel.com/business/casestudies/cnooc.pdf

[9] Source: *Dual-Core Intel® Itanium® 2 Processor, SQL Server* 2005 Yield 8X Speedup for Microsoft*, an Intel case study: www.intel.com/business/casestudies/microsoft_2.pdf

[10] Performance measured using OLTP (NT/SQL), SPECjbb2005, SPECCPU, Linpack, and SAP-SD. Intel Internal Measurement (March, 2006) comparing system configurations of Dual-Core Intel Itanium 2 processor 1.6GHz with 24MB L3 cache to Intel Itanium 2 processor 1.6GHz with 9MB L3 cache. Actual performance may vary.
See: www.intel.com/performance/server/itanium2

[11] For the latest performance benchmarks, visit the Intel Web site at: www.intel.com/performance/server/itanium2/index.htm

[12] For an overview of the advantages this brings to business customers, see the article: *How Intel Keeps Its Enterprise Customers Coming Back for More*, by Roger L. Kay, eWeek, March 10, 2006: www.eweek.com/print_article2/0,1217,a=173288,00.asp

For more information about Intel's latest technological advances, visit the Intel Web site at: www.intel.com/technology/silicon/index.htm

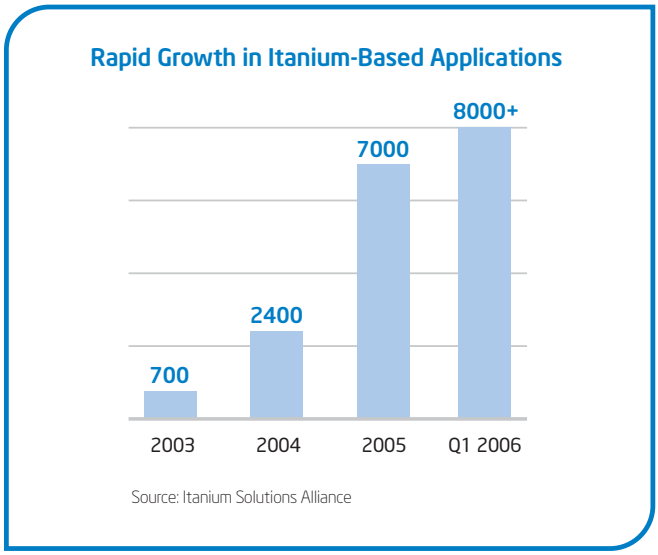
A Rich Portfolio of Business Solutions

"...Itanium servers represent a rich set of server solutions, which can address a full range of requirements and can support a wide range of customer workloads."

– Nathaniel Martinez and Thomas Meyer, IDC[13]

Dozens of server vendors now offer Itanium-based systems, including 8 of the world's 10 largest platform developers. Complete solutions stacks are available across a wide and growing array of business-critical applications. Support is particularly strong for database, data warehousing, and business intelligence solutions; large, mission-critical ERP and CRM applications; and HPC and technical computing solutions. Altogether, application availability has more than doubled in the past 12 months, to more than 8,000 optimized applications (Figure 4).

Figure 4. Application availability for Itanium-based systems has more than doubled in the past year, and porting efforts continue to accelerate.



Case Study: Itanium-based Solutions in Action

Forbes.com

- World's leading business Web site
- 14-15 million unique visitors each month
- More than 2,000 stories published daily

Forbes.com delivers news, information, analysis, and advice to a demanding audience of affluent and influential business leaders, along with precisely targeted advertising from some of the world's leading companies. Success depends on fast delivery of media-rich content, and on sophisticated data-mining tools that help channel the right advertising to the right visitors. To make it work, Forbes.com has standardized much of its infrastructure on Intel processor-based servers, with Itanium-based systems handling the most demanding workloads.

"The Intel-based servers give us great performance and responsiveness–and the reliability is well beyond 99.999 percent," says Michael E. Smith, Vice President and General Manager of Operations. ***"Whatever our advertisers want to try, our Intel server platforms give us the confidence that we can deliver."*** They also give Forbes.com the flexibility to scale quickly and cost-effectively as workloads grow, so they can continue to deliver world-class value to both their readers and their advertisers.

Read the Intel case study at:
www.intel.com/business/casestudies/forbes.pdf

[13] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

"From the early days, we've gotten fantastic performance for the Oracle database running on Itanium-based servers. This has become a strategic platform for us and our customers..."

– Prem Kumar, VP, Server Technologies, Oracle

Many more Itanium-based applications are on the way. One key example is the Oracle E-Business Suite, which Oracle is currently working to deliver for Itanium-based systems running HP-UX 11i. Oracle E-Business Suite adds comprehensive application functionality, enabling businesses to host a full range of core Oracle applications on Itanium-based systems. Other Oracle software products available for Itanium-based systems include Oracle Application Server, and Oracle Database, which has been available for Itanium-based systems for several years.[14] Another example is IBM middleware software. Though many of these applications have already been ported to HP-UX 11i, efforts are accelerating, and will ultimately triple the number of IBM middlware applications available for Itanium-based systems.

Itanium-based servers also support the enormous number of applications already developed for IA-32 based servers, and performance for these applications will be substantially improved on new Dual-Core Intel Itanium 2 processor-based servers.

In addition to porting and new application development, binary translation solutions are emerging that can deliver near-native performance for Sun Solaris-based applications on Itanium-based servers—without any software changes. This will dramatically increase application options and further simplify migrations from legacy platforms (see the sidebar: *Porting Made Painless*, on page 8).

High Value in Real-World Deployments

"In our experience, expectations have been exceeded with our Itanium implementation. We have better cost effectiveness, fewer systems, easier monitoring of the systems, and much higher performance."

– Infrastructure Specialist, Dairy Industry[15]

When a catastrophic tsunami struck Indonesia, an Itanium-based system helped scientists turn hundreds of gigabytes of satellite data into real-time, three-dimensional maps that were used to assess the impact and coordinate relief efforts. According to John Graham, chief scientist of San Diego State University's Visualization Center, ***"The integration of the Linux software and sheer performance of the Itanium system have made a major impact on remote sensing and GIS in ways that are changing the world."***[16] Clearly, it is the capacity and performance of the system that made such a difference. Yet it is its affordability that made deployment possible, and its scalability that will allow the research team to grow the solution cost-effectively as requirements increase.

This is just one example among many. Since 2002, nearly 100,000 Itanium 2 processor-based systems have been deployed worldwide.[17] Some organizations are using them to reduce costs for new deployments. Others are using them to scale and consolidate existing Windows* and Linux* applications, and still others to migrate away from costly and proprietary RISC architectures.

[14] In addition to the porting effort, Oracle is offering very favorable software licensing. For an overview of these developments, see the article, *Oracle Designates HP-UX on Itanium as a Strategic Platform*, by Timothy Pricket Morgan, The Unix Guardian, March 2, 2006: www.itjungle.com/tug/tug030206-story02.html

[15] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

[16] Source: Itanium Solutions Alliance Press Release, January 26, 2006: www.itaniumsolutionsalliance.org/news/pr/view?item_key=16bc7596a8faf9d28b7f69e2c70ebd10e265a379. For a complete case study of the San Diego State University deployment, see *Accelerating Tsunami Relief at San Diego State University*, an SGI case study: www.sgi.com/pdfs/3827.pdf

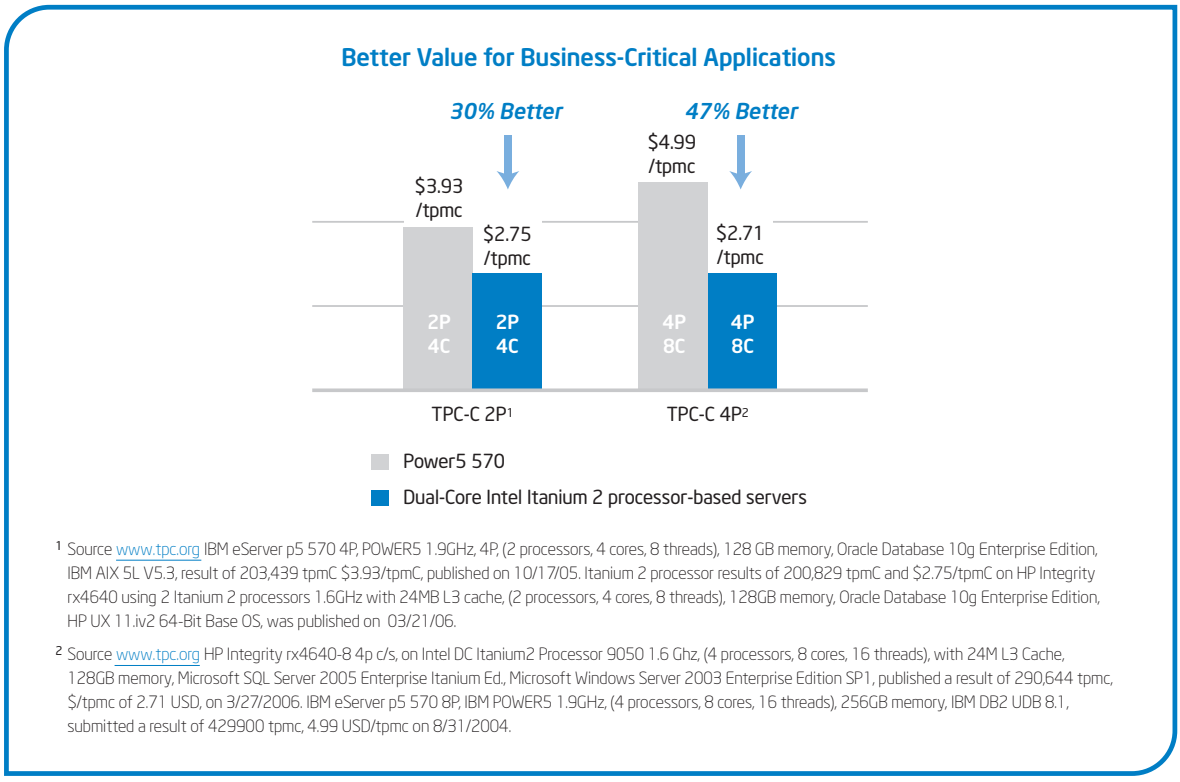
[17] Based on data from *IDC Server Tracker Q1, 2006.*

Recent benchmarks show Intel Itanium 2 processor-based servers delivering substantially better price/performance than RISC-based systems for data-intensive applications (Figure 5). In addition, the multi-OS support of Itanium architecture provides considerable choice and flexibility for consolidating and migrating legacy applications. Several vendors offer robust virtualization and partitioning capabilities in their particular operating environments. Xen* virtualization software (www.cl.cam.ac.uk/Research/SRG/netos/xen/), developed by the open source Linux community, is also compatible with Itanium-based solutions, as is SWSoft's Virtuozzo* (www.swsoft.com/en/products/virtuozzo/). Organizations can use these solutions to carve up an Itanium-based server into multiple virtual servers, and to host large numbers of consolidated applications in secure partitions.

Itanium architecture also supports true mainframe-class implementations. As one example, Platform Solutions, Inc. (www.platform-solutions.com/) offers IBM-compatible mainframes on Itanium architecture. These highly scalable and reliable Itanium-based servers can run the IBM z/OS* and OS/390* operating systems, as well as Linux, UNIX, and Windows. They provide an ideal path for mainframe modernization, and a great way to reduce costs and improve flexibility, while preserving the value of legacy applications.

Itanium-based solutions offer similar benefits for legacy RISC solutions. By migrating these applications onto Itanium-based servers, organizations can improve performance, reduce costs, and establish a more consistent operating environment across their business-critical and mainstream applications.[18] They can also take advantage of the larger pool of engineers and technicians with expertise in Intel-based technology. (For information on migrating RISC/UNIX solutions to Microsoft Windows on Itanium-based systems, visit www.migrationforunix.org/; for extensive resources for Linux on Itanium solutions, visit www.gelato.org/).

Figure 5. New Dual-Core Itanium 2-based systems are delivering substantially better price/performance than RISC-based systems. They are also helping organizations drive down their operational costs and improve the flexibility and scalability of their implementations.



[1] Source www.tpc.org IBM eServer p5 570 4P, POWER5 1.9GHz, 4P, (2 processors, 4 cores, 8 threads), 128 GB memory, Oracle Database 10g Enterprise Edition, IBM AIX 5L V5.3, result of 203,439 tpmC $3.93/tpmC, published on 10/17/05. Itanium 2 processor results of 200,829 tpmC and $2.75/tpmC on HP Integrity rx4640 using 2 Itanium 2 processors 1.6GHz with 24MB L3 cache, (2 processors, 4 cores, 8 threads), 128GB memory, Oracle Database 10g Enterprise Edition, HP UX 11.iv2 64-Bit Base OS, was published on 03/21/06.

[2] Source www.tpc.org HP Integrity rx4640-8 4p c/s, on Intel DC Itanium2 Processor 9050 1.6 Ghz, (4 processors, 8 cores, 16 threads), with 24M L3 Cache, 128GB memory, Microsoft SQL Server 2005 Enterprise Itanium Ed., Microsoft Windows Server 2003 Enterprise Edition SP1, published a result of 290,644 tpmc, $/tpmc of 2.71 USD, on 3/27/2006. IBM eServer p5 570 8P, IBM POWER5 1.9GHz, (4 processors, 8 cores, 16 threads), 256GB memory, IBM DB2 UDB 8.1, submitted a result of 429900 tpmc, 4.99 USD/tpmc on 8/31/2004.

[18] For more information about UNIX migration, see the IDC report, Understanding Unix Migration: A Demand-Side View, by Matthew Eastwood, IDC #34816, Volume:1, January 2006. Available at: www.migrationforunix.org/

Smooth Migrations

"Importantly, most of the customers interviewed stated that their business faced barely any disruption in the architecture switch to Itanium..."

– Nathaniel Martinez and Thomas Meyer, IDC[19]

Any new deployment or migration of business-critical applications involves some level of risk. Yet an extensive survey by IDC indicates that businesses are migrating to Itanium-based solutions with relative ease and with very little disruption.[19] Several factors contribute to the success of these migrations.

- **Multi-OS Support**—Organizations have a broad array of operating systems to choose from, so they can often take advantage of existing expertise within their organization. Migrations are simpler and learning curves are reduced.
- **Easy Integration with x86**—Itanium-based solutions have much in common with today's standards-based x86 solutions, so experience and skills translate easily to the new environment. The two architectures also integrate well together. Intel Xeon processor-based servers are appropriate for many workloads, such as Web transactions and computations that can be split into smaller components and reassembled (e.g., Google-type searches and many HPC applications). Itanium 2-based solutions are better for data-intensive, business-critical workloads that can take full advantage of large memory and enhanced parallel processing. Many businesses are choosing to host data-tier applications on Itanium 2-based servers, while using Intel Xeon processor-based servers at the application layer.[20]
- **Strong Vendor Support**—Leading Itanium-based server and software vendors offer services and support that can simplify migrations and reduce risk, as do many independent solution providers. Additional resources are available from the Itanium Solutions Alliance (www.itaniumsolutionsalliance.org), the Intel® Software Network (www.intel.com/cd/ids/developer/asmo-na/eng/dc/itanium/index.htm), and Intel® Solution Services (www.intel.com/cd/services/intelsolutionservices/asmo-na/eng/index.htm).

Porting Made Painless

"Transitive's ability to deliver up to 80 percent of 'native' performance, when executing binary images targeted for one platform on incompatible hardware or software platforms could be a game-changing event that restructures the computer industry."

– Nathan Brookwood, Principal Analyst, Insight 64

Most businesses have an enormous investment tied up in their legacy software applications, and migrating that code to a new platform can be a daunting proposition. New binary translation software from Transitive Corporation is eliminating that roadblock, by enabling existing RISC-based application binaries to run transparently on Itanium-based systems—with no code changes and near native performance.

With QuickTransit for Solaris/SPARC-to-Linux/Itanium*, businesses can expect:

- **Instant migration** of Solaris-based applications to Itanium-based systems.
- **Better performance** than the fastest SPARC-based systems.
- **Complete functionality and interoperability**, so translated and natively compiled applications can run side-by-side.
- **Transparent use and management** that helps keep operation simple and costs low.

For businesses in need of a more flexible and cost-effective server infrastructure, these capabilities will provide a low-cost, low-risk migration path for both commercial and in-house applications. Availability is expected in Q4, 2006, either as a stand-alone software package or pre-integrated by leading Itanium-based system vendors. A comparable product for Intel Xeon processor-based servers will also be available.

For more information, visit:
www.transitive.com/products/sol_itanium.htm

[19] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

[20] For more information, see the Itanium Solutions Alliance white paper, *Itanium 2-based Solutions and the x86 Architecture; Optimizing IT Value by Mixing and Matching Industry-Standard Server Platforms:* www.itaniumsolutionsalliance.org/news/whitepapers_brochures/Itanium_and_x86_white_paper.pdf

Investment Protection Through Broad Vendor Support

"In what should send shivers down their rivals' spine, Intel, Hewlett-Packard and seven other leading server companies have committed $10 billion over a period of the next five years until 2010 in order to promote the usage of the Itanium processor."

– Martin Booth, EarthTimes.org[21]

On January 26, 2006, the Founding Sponsors of the Itanium Solutions Alliance[22] publicly committed to investing $10 billion in Itanium-based solutions over the remainder of this decade. That investment will continue to drive advances at every level, from processor and systems development, to ongoing application porting—and it does not include the parallel investments that will be made by many smaller platform vendors, and by leading software and solution providers in support of Itanium-based solutions.

Intel Itanium 2 microarcihitecture is younger than competing platforms, and can be expected to scale well into the future. It supports very large addressable memory (up to 1 petabyte, or 1,0000 terabytes), a high level of parallelism and a large number of registers, all of which provide substantial capacity for future scaling.[23] It was also uniquely designed to allow explicit, compiler-based software optimization. This will enable ongoing performance scaling through software enhancement, without requiring major optimization efforts from software vendors.[24]

Intel Itanium 2 microarchitecture also includes advanced security features that offer fundamental advantages for protecting business systems, applications, data, and transactions. These features include 4 privilege levels (versus only 2 in RISC architectures), support for more than 16 million memory protection keys, and ultra fast parallel throughput for encryption algorithms. Software solutions are already on the way that will help businesses take advantage of these capabilities to dramatically improve the security and performance of their existing applications and networks (for more information, visit www.secure64.com).[25]

Case Study: Itanium-based Solutions in Action

AVTOVAZ

- The leading auto manufacturer in Eastern Europe
- Manufactures 3 cars per minute in one of the world's largest factories
- Shipped nearly 1 million cars in 2004

To continue its rapid growth and meet the demands of an aggressive international auto market, AVTOVAZ needed to increase the performance, scalability, and accessibility of its core ERP application. According to Yuriy Katyanov, CIO of AVTOVAZ, ***"We needed a system that could guarantee the delivery of our business-critical reports, as well as support wider employee access to the portal-based applications."***

To meet this need, the company consolidated 29 RISC-based servers onto just two Itanium-based systems. The new solution has accelerated data retrieval up to 250 percent, doubled the number of concurrent users that can access the system, and substantially reduced total cost of ownership. The business impact has been equally positive. According to Katyanov, ***"The new solution has given us the ability to work much more efficiently and productively. Staff are now able to create and deliver vital reports in a fraction of the time it took before."***

Read the complete Intel case study at: www.intel.com/business/casestudies/avtovaz.pdf

[21] Source: www.earthtimes.org/articles/show/5158.html

[22] The Itanium Solutions Alliance was formed to drive coordinated development and support for Itanium-based solutions. It includes some of the most trusted names in high-end computing, including Bull, Fujitsu, Fujitsu Siemens Computers, Hitachi, HP, Intel, NEC, SGI, Unisys, BEA, Microsoft, Novell, Oracle, Red Hat, SAP, SAS and Sybase. The Alliance offers extensive resources for software vendors and corporate IT organizations interested in developing and deploying Itanium-based solutions: www.itaniumsolutionsalliance.org/home

[23] To find out why Itanium architecture has such strong potential for ongoing advances, see the Itanium Solutions Alliance white paper, *The Itanium Advantage; Why Intel® Itanium® 2 Microarchitecture is Ideal for multi-core performance scaling.* www.itaniumsolutionsalliance.org/news/whitepapers_brochures/The_Itanium_Advantage.pdf

[24] *"I'm bullish on IA-64 because a dream world of compilers that take their sweet time to build and optimize but produce mind-blowing code will surface there first."* Source: The CPU's next 20 years, by Tom Yager, ComputerWorld, September 7, 2005: www.computerworld.com/printthis/2005/0,4814,104436,00.html

[25] For an in-depth discussion of the importance of Itanium architecture in solving today's security challenges, see the Secure64 white paper, "The 64-bit Inflection Point," by Bill Worley, Jr., PhD and Peter J. Cranstone: www.secure64.com/products/64-Bit_Inflect_White_Paper-FINAL1.pdf

A Better Foundation for Business Growth and Innovation

"For the first time ever, businesses can choose from a wide range of standards-based servers, operating systems, applications, and vendors for their most demanding enterprise solutions."

– The Itanium Solutions Alliance[26]

A stable business environment lends itself well to core computing solutions that are costly and complex. Today's rapidly changing business environment does not. To stay competitive, businesses must be able to adapt their business processes, along with the underlying computing infrastructure that supports them.

The flexibility and choice offered by Itanium-based solutions are particularly valuable given today's challenges. The broad choice of platform vendors, servers, operating systems, applications, and solution providers simplifies integration across diverse environments. It also provides a more scalable and flexible foundation for future growth.

Intel Itanium architecture supports 10 operating systems, including Windows, Unix, and multiple flavors of Linux. Platform options range from affordable 2-processor servers and blades to SMP systems with up to 512 processors and up to 128 terabytes of globally shared memory. Itanium-based solutions also support the highest levels of availability for mission-critical environments (see Appendix A). As one example, an Itanium 2-based system now supports 7-nines availability (99.99999 percent uptime)[27], and multiple Itanium 2-based system vendors offer robust and highly redundant systems that deliver 5-nines and higher availability.

Just as important is the lower TCO enabled by Itanium-based solutions. Organizations not only get more value from their investments but can free up funds for new projects and upgrades. With a steady stream of cost-effective computing resources, businesses can focus more resources on unlocking growth through business and technical innovation that improves their product development, customer service, business efficiency, and overall responsiveness.

Conclusion

"Moving forward, the credibility and recognition of the market will move up rapidly as OEM support for the high-end Itanium solutions is extending."

– Nathaniel Martinez and Thomas Meyer, IDC[28]

As the world works to solve the economic, social, and business challenges of the 21st century, the need for cost-effective and flexible computing power will continue to increase. From energy creation and conservation, to disaster responsiveness and healthcare efficiency, the ability to collect, analyze, and share large amounts of information can be expected to play a central role in solving some of our greatest challenges.

By delivering high-end computing power on an affordable and broadly supported architecture, Itanium-based solutions provide a fundamental resource for these efforts. Large organizations are able to deploy more computing capacity at less cost, and adapt their solutions more easily to stay in the forefront of innovation. Many smaller organizations are able to afford high-end computing power for the first time, which can help them take advantage of emerging software tools to accelerate research, growth, and development.

The dramatic performance gains being achieved with new Dual-Core Intel Itanium 2 processor-based systems are adding to these advantages, and further accelerating the global transition toward Itanium-based systems. As the decade moves forward, the $10 billion investment in Itanium-based solutions will help to ensure rapid advances and ongoing innovation, so organizations can continue to build on their current investments. Most important, the community of Itanium-based vendors will continue to grow, so businesses will have even more options, better value, and increased investment protection in the years ahead.

Get More Information

The following Web sites offer extensive resources for Itanium-based solutions:

- Intel: www.intel.com/go/itanium
- Itanium Solutions Alliance: www.itaniumsolutionsalliance.org/home/

[26] Source: *Itanium® 2-based Solutions versus the IBM Power* Architecture: Getting Better Value from Your High-End Solutions,* an Itanium Solutions Alliance White Paper: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/ibmPowerweb.pdf

[27] 99.99999 percent availability is supported off-the-shelf by the HP Integrity Non-Stop* family of servers. For more information, see the HP Web site, at: http://h20223.www2.hp.com/NonStopComputing/cache/121352-0-0-0-121.html

[28] Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization," August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf

Appendix A: Mainframe-Class RAS

The Intel Itanium 2 processor provides mainframe-class RAS capabilities, which is allowing some of today's most trusted, high-availability system vendors to deliver business-critical solutions on an affordable, industry-standard architecture.

Figure 6. Architecture Reliability Comparison[a]

	Scalable Enterprise Servers			Mainstream Business Servers		
RAS Feature	**Intel Itanium® 2 Platforms**	**Typical Mainframe**	**Typical RISC**	**Intel Xeon® MP Platforms**	**Intel Xeon® Platforms**	**Other x86 Systems**
Cache ECC Coverage	✔	✔	✔	✔	✔	✔
Memory Single Device Error Correct	✔	✔	Select Vendors	✔	✔	✔
Memory Retry on Double-Bit Error	✔	✔	✔	✔	✔	
Error Recovery on Data Bus (ECC)	✔	✔	✔	✔		
Internal Logic Soft Error Checking	✔	✔	Select Vendors			
Bad/Poisoned Data Containment	✔	✔	Select Vendors			
Cache Reliability	✔ (Intel® Cache Safe Technology)	✔		2H 2006		
Memory Sparing	✔	✔	✔	✔	✔	2006
Memory Mirroring	✔			✔	✔	
Hot Plug I/O (PCI-X, PCI Express)	✔	✔	✔	✔	✔	Select Vendors
Memory Hot Swap	✔			✔		
Processor Lockstep Support	✔			✔[b]		

Real-Time Protection | Fail Safe Systems | On-Line Repair | Real-Time Cross-Check

[a] All time-frames, dates, and products are subject to change without further notification.

[b] Lockstep is supported by selected vendors via enabled chipsets and platforms. Source: www.intel.com/business/bss/products/server/ras.pdf

Appendix B: Additional Resources

Deployment and Migration Support

System Vendors

- Fujitsu User Data Migration Services: www.computers.us.fujitsu.com/www/services.shtml?services/professional/operational/data_migration_user
- Fujitsu Siemens Computer Professional Services, Migration and Tuning: www.fujitsu-siemens.com/services/prof_services/index.html
- HP Porting and Migration Services: http://h20219.www2.hp.com/services/cache/10788-0-0-225-121.html?jumpid=reg_R1002_USEN
- Platform Solutions Inc: www.platform-solutions.com/
- Unisys Migration Services: www.unisys.com/products/es7000__servers/business__solutions/migration/services.htm

Software Vendors

- Microsoft Resources for Interoperability and Migration of UNIX and Windows: www.microsoft.com/technet/interopmigration/unix.mspx
- Novell Data Center Migration Services: www.novell.com/linux/migrate/
- Redhat Migration Center: www.redhat.com/rhel/migrate/

Other

- Gelato Federation—an open community promoting and supporting Linux on Itanium-based systems: www.gelato.org
- Intel RISC Migration Resource Center: www.intel.com/business/bss/products/server/itanium2/risc.htm
- Intel Solution Services Data Center Migration Solutions: www.intel.com/cd/services/intelsolutionservices/asmo-na/eng/solutions/dcf/dcm/index.htm
- Itanium Solutions Alliance: www.itaniumsolutionsalliance.org
- Itanium Solutions Catalog—a comprehensive list of applications and tools for Itanium-based systems: www.itaniumsolutionsalliance.org/kshowcase/view
- Transitive: www.transitive.com
- Unix Migration Resource Center: www.migrationforunix.org

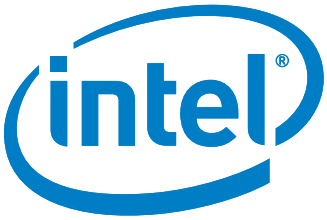
Analyst White Papers

- End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-Based Standardization, an IDC white paper sponsored by HP, August 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/CG18M_Web.pdf
- Customer Perceptions of the Future of Itanium, IDC, Doc #34842, February 2006: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/34842.pdf
- The Itanium Solutions Alliance Brings Investment Protection to Enterprise Computing, an IDC white paper sponsored by the Itanium Solutions Alliance, September 2005: www.itaniumsolutionsalliance.org/news/whitepapers_brochures/ISA_Whitepaper.pdf
- Scalable Windows Servers for the Datacenter, by Jean S. Bozman and Matthew Eastwood, an IDC white paper sponsored by HP and Intel, March 2006 www.migrationforunix.org/downloads/ScalableWindowsfortheDatacenterItanium_Integrity.pdf

Itanium Solutions Alliance White Papers

www.itaniumsolutionsalliance.org/home/

- Itanium 2-based Solutions versus Sun's SPARC® Architecture: Reducing Risk and Building a More Solid Foundation for Business Success www.itaniumsolutionsalliance.org/news/whitepapers_brochures/Itanium_vs._Sun_SPARC_FINAL.pdf
- Itanium 2-based Solutions versus the IBM Power* Architecture: Getting Better Value from Your High-End Solutions www.itaniumsolutionsalliance.org/news/whitepapers_brochures/ibmPowerweb.pdf
- Migrating Business-Critical Applications from UNIX to Windows and Itanium 2-Based Servers www.itaniumsolutionsalliance.org/news/whitepapers_brochures/06_02_10_UNIX_to_Windows_Migration_FinalFinal_0.pdf
- Itanium 2-based Solutions and the x86 Architecture: Optimizing IT Value by Mixing and Matching Industry-Standard Server Platforms www.itaniumsolutionsalliance.org/news/whitepapers_brochures/Itanium_and_x86_white_paper.pdf
- The Itanium Advantage: Why Intel® Itanium® 2 Microarchitecture is Ideal for Multi-core Performance Scaling www.itaniumsolutionsalliance.org/news/whitepapers_brochures/The_Itanium_Advantage.pdf



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